

Validation of a crop growth model in Piedmontese vineyards

Valentina Andreoli^{1*}, Claudio Cassardo¹, Silvia Cavalletto², Silvia Ferrarese¹, Silvia Guidoni², Elena Mania²

¹University of Torino, Department of Physics, via Pietro Giuria 1, 10125 Torino

²University of Torino, Department of Agricultural, Forest and Food Sciences, Largo P. Braccini 2, 10095 Grugliasco

* Corresponding author. Tel: 0116707438, E-mail: vale.andreoli@libero.it,
valentina.andreoli@unito.it

Keywords: numerical model, meteorology, viticulture, climate

Agricultural production is substantially affected by variability in weather conditions and recently by climate change. For this reason, it is essential to understand how much meteorology and climate can influence crop productivity and quality.

In the frame of a multiannual project, a numerical crop growth model has been specifically developed in order to evaluate the effects of micrometeorological conditions on vine growth and grape quality. The numerical model simulates physiological and phenological vineyard conditions allowing the knowledge of plant processes at the microscale and their responses to environmental forcing. The target of the project is the development of an advanced tool able to monitoring in real time the physiological and phenological vine processes, and to support the activity of decision-making, allowing a sustainable vineyard management.

The boundary meteorological conditions required by the model during the simulation are the following physical quantities: temperature and relative humidity of the air above the vegetation, solar global radiation, photosynthetically active radiation, soil temperature and water content in the root zone, wind speed and direction above the vegetation, rainfall, and leaf wetness. The numerical model, in addition to the geographical information, also requires some initial and boundary conditions related to vineyard and soil characteristics: soil texture, plant density, varietal characteristics, and vineyards management procedures. The main model outputs are the predawn leaf water potential, the principal phenological phases, the leaf development, the plant yield, and the grape sugar concentration.

A specific advanced experimental campaign has been performed within a vineyard of Nebbiolo cultivar located in Langhe area (Piedmont, Italy), during the 2016 and 2017 vegetative seasons, by directly measuring phenological phases and some physiological variables, with the specific aim to calibrate and validate the numerical model. Here, the model will be described and the main results of the validation will be presented.



Associazione Italiana di Scienze
dell'Atmosfera e Meteorologia

PRIMO CONGRESSO NAZIONALE

10-13 settembre 2018

Dipartimento di Arti Visive, Università di Bologna, Italia

CONTRIBUTI

co-organizzatori



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



main sponsors

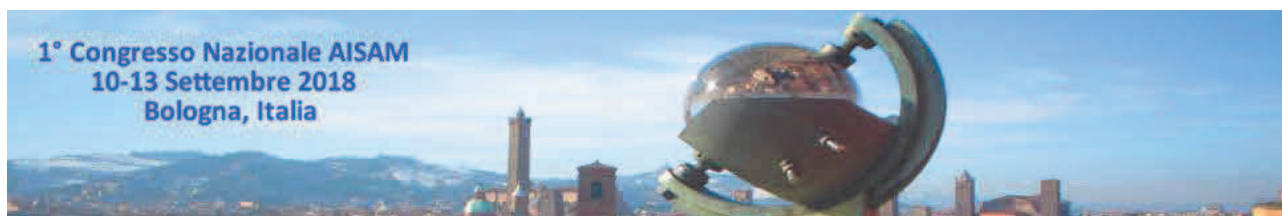


VAISALA

sponsors



THREE-DIMENSIONAL STRUCTURE OF WIND TURBINE WAKES AS MEASURED BY SCANNING LIDAR	250
N. Bodini, J. K. Lundquist, D. Zardi	
A HIGH-RESOLUTION SOLAR RADIATION ATLAS FOR THE TRENTINO REGION IN THE ALPS	251
L. Laiti, L. Giovannini, L. Panziera, D. Zardi	
ANALISI TESTUALE DEI BOLLETTINI METEO COME STRUMENTO PER VALIDARE LA CLASSIFICAZIONE DEI TIPI DI CIRCOLAZIONE	252
V. Grasso, A. Crisci, G. Betti, B. Gozzini, G. Messeri, R. Vallorani, F. Zabini	
THE COMBINED ROLE OF GREEN ROOFS AND VEGETATION ON URBAN CLIMATIC CONDITIONS: A CASE STUDY IN THE CITY OF BOLZANO (ITALY) BY MEANS OF WRF/UCMS SIMULATIONS	253
G. Pappaccogli, L. Giovannini, A. Zonato, D. Zardi, A. Martilli	
ASSESSING WINTERTIME URBAN HEATING ENERGY CONSUMPTION IN A MEDIUM-SIZE ITALIAN CITY	254
G. Pappaccogli, L. Giovannini, D. Zardi, A. Martilli	
ASSESSING THE ACCURACY OF A SIMPLE BUILDING ENERGY MODEL (BEP+BEM) APPLYING ANALYTICAL VERIFICATION AND COMPARATIVE DIAGNOSTIC (BESTEST): A COMPARISON OF THE MAIN BUILDING VARIABLES WITH TRNSYS	255
G. Pappaccogli, L. Giovannini, F. Cappelletti, D. Zardi, A. Martilli	
MONITORING THE INTERNAL CLIMATE OF A MONUMENTAL BUILDING IN VIEW OF CONSERVATION AND PUBLIC USE: THE CASE OF THE S.MARIA ODIGITRIA CHURCH (ROME)	256
M. Favaron, D. Fraternali	
EVALUATION OF THE CLIMATOLOGICAL WIND SPEED SIMULATED BY THE WRF MODEL OVER COMPLEX TERRAIN	257
L. Giovannini, G. Antonacci, D. Zardi, L. Laiti, L. Panziera	
VALIDATION OF A CROP GROWTH MODEL IN PIEDMONTESE VINEYARDS	259
V. Andreoli, C. Cassardo, S. Cavalletto, S. Ferrarese, S. Guidoni, E. Mania	



Dipartimento di Arti Visive, Laboratorio delle Arti, Università di Bologna
Piazzetta P.P. Pasolini, 5/b (già via Azzo Gardino, 65/a)

	case study in the city of Bolzano (Italy) by means of WRF/UCMs simulations	
P6-12	Assessing wintertime urban heating energy consumption in a medium-size Italian city	<u>Pappaccogli G.</u> , Giovannini L., Zardi D., Martilli A.
P6-13	Assessing the accuracy of a simple Building Energy Model (BEP+BEM) applying analytical verification and comparative diagnostic (BESTEST): A comparison of the main building variables with TRNSYS	<u>Pappaccogli G.</u> , Giovannini L., Cappelletti F., Zardi D., Martilli A.
P6-14	Monitoring the Internal Climate of a Monumental Building in View of Conservation and Public Use: the Case of the S.Maria Odigitria Church (Rome)	<u>Favaron M.</u> , Fraternali D.
P6-15	Evaluation of the climatological wind speed simulated by the WRF model over complex terrain	<u>Giovannini L.</u> , Antonacci G., Zardi D., Laiti L., Panziera L.
P6-16	Validation of a crop growth model in Piedmontese vineyards	<u>Andreoli V.</u> , Cassardo C., Cavalletto S., Ferrarese S., Guidoni S., Mania E.
P6-17	Sistema integrato di previsioni e analisi per la qualità dell'aria in Toscana	<u>Guarnieri F.</u> , Calastrini F., Busillo C., Pasi F., Messeri G.
P6-18	Coupling numerical weather prediction and radiative transfer models for applications in tropospheric radiocommunications	<u>Biscarini M.</u> , Marzano F., Montopoli M., De Sanctis K., Di Fabio S., Milani L., Magde K., Brost G.
P6-19	SunRISE: a web platform of weather data relevant for the electro-energy sector	<u>Decimi G.</u> , Collino E., Sperati S.
P6-20	Libsim, un software libero made in Italy per l'elaborazione di dati meteorologici	<u>Cesari D.</u> , Patruno P.